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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/590,621	06/08/2000	Salman Akram	3936US (99-0066)	1302

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EXAMINER

BEREZNY, NEMA O

ART UNIT	PAPER NUMBER
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2813

DATE MAILED: 03/07/2002

10

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/590,621

Applicant(s)

AKRAM ET AL.

Examiner

Nema O Berezny

Art Unit

2813

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 02 January 2002.
- 2a) ☒ This action is FINAL. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-23 and 36-49 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-23 and 36-49 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 08 June 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

The substitute specification, filed 4-9-01 as paper no.3, has been entered.

Cancellation of claims 24-35 in paper no.3 is hereby acknowledged.

Claim Rejections - 35 USC § 112

The rejection of claims 20, 22, and 36 under 35 U.S.C. 112, second paragraph made in the prior Office Action is hereby withdrawn, subsequent to corrections made by Applicant in Amendment A, filed 1-2-02.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 1-17, 36-40, and 41-49 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is uncertain what Applicant is claiming in regard to a "unitary structure." There is no disclosure of a unitary structure in instant specification. If Applicant is referring to the limited embodiment of just one stabilizer structure, this would conflict with the remaining elements of said claims which claim "at least one stabilizer" and especially "a plurality of stabilizers."

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 8, 10, 13-16, 36, and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Kuniaki (JP10189653). Kuniaki discloses forming a flip chip semiconductor die (Fig.1 el.3) having an active surface (el.4a); and forming a plurality of unitary stabilizers (el.12) to protrude from said active surface at a height substantially consistent to a die-to-substrate distance (Fig.2), located at the four corners of said active surface (Fig.1), and configured to at least partially stabilize an orientation of said flip chip die when disposed face down over a higher level substrate (abstract – lines 1-4, 25-29). Kuniaki also discloses providing a sealing material (el.10a-d) on said active surface to secure said stabilizers to said sealing material (abstract – lines 26-29), wherein it is implied that said sealing material adheres said stabilizers to said active surface. Kuniaki also discloses forming solder bumps (el.11) on bond pads (el.7) of said flip chip die, bonding said solder bumps to corresponding contacts (Fig.2 el.14) of said substrate (el.2), forming an encapsulant material (el.5) between said flip chip die and said substrate, and positioning said stabilizers so as to avoid contact with said conductive traces on said substrate (Fig.2).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 6, 7, 11, and 37-39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuniaki as applied to claims 1-5, 8-10, and 36 above, and further in view of Hull (4,575,330). However, Kuniaki does not disclose forming stabilizers from photoimageable material or as at least two superimposed, contiguous, mutually adhered layers of insulative material. Hull discloses forming a three-dimensional object for a microelectronic device (col.4 lines 34-39), comprising: forming a plurality of superimposed, contiguous, mutually adhered layers of photoimageable material of any desired shape (col.5 lines 29-65). It is implied in the process of stereolithography that said stabilizer could assume several different heights or distance from said substrate, including a distance greater than or less than a minimum distance of at least one of said conductive structures. Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the stereolithographically formed stabilizers of Hull with the method of forming a flip chip device of Kuniaki in order to precisely form insulative stabilizers in a densely packed package without risk of short circuiting.

Examiner takes Official Notice that lengthening said conductive structures during bonding is conventionally practiced in the semiconductor industry, and would have been obvious to a person skilled in the art at the time of the invention. Bonding two

conductive structures together by using a third conductive reflowed material while supported by a stabilizer structure will inherently lengthen the existing two conductive structures. Said bonding could advantageously be used when the third material has a lower melting point than either of the two structures, and therefore bonding can occur at a lower temperature.

Claims 9 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuniaki. However, Kuniaki does not disclose providing a semiconductor wafer with a plurality of flip chip dice or applying a layer of photoresist material and patterning said photoresist. Examiner takes Official Notice that wafer fabrication, and applying and patterning a photoresist layer are conventionally practiced in the semiconductor industry for the purposes of mass production of said flip chip dice and for patterning an underlying layer, respectively, and would have been obvious to a person skilled in the art at the time of the invention.

Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuniaki as applied to claims 1-5, 8, 10, and 13-16 above, and further in view of Ghaem et al. (6,046,910). However, Kuniaki does not disclose bonding a conductive pillar to said bond pad. Ghaem discloses bonding conductive pillars (Fig.4 el.52) between a flip chip device and a substrate. Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the conductive pillars of Ghaem with the method of

forming a flip chip device of Kuniaki in order to form taller and more stable conductive structures between the device and the substrate.

Claims 18-19 and 41-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ghaem et al. (6,046,910) in view of Hull (4,575,330). Ghaem discloses forming a semiconductor substrate (Fig.6 el.20) with contact pads (el.26), and forming at least one stabilizer (el.40) on the active surface of said substrate between one of said contact pads and a peripheral edge of said substrate, to at least partially stabilize the semiconductor device on said substrate when disposed face down over a higher level substrate (Fig.6). However, Ghaem does not disclose forming said stabilizer stereolithographically. Hull discloses recognizing a location and orientation of a stabilizer to be formed (col.8 lines 6-9), and forming a three-dimensional stabilizer for a microelectronic device (col.4 lines 34-39), comprising: forming a plurality of superimposed, contiguous, mutually adhered layers of photoimageable insulative material of any desired shape (col.4 line 63 – col.5 line 3; col.5 lines 29-65). Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the stereolithographically formed stabilizers of Hull with the method of forming a flip chip device of Ghaem in order to precisely form insulative stabilizers in a densely packed package without risk of short circuiting.

Ghaem also discloses forming a plurality of stabilizers (Fig.6) adjacent at least one corner of the device active surface (Fig.8) to have a height substantially consistent over the die to substrate distance and avoid contact with the conductive traces on said

substrate (Fig.6), introducing an encapsulant material between said device and said substrate (Fig.1 el.50), and disposing a solder bump (el.32) on said bond pads.

Claims 20-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ghaem in view of Hull as applied to claims 18-19 above, and further in view of Migdal et al. (5,870,220). However, Ghaem in view of Hull does not disclose storing data of said substrate and another device in computer memory, and using a machine vision system to stereolithographically form said stabilizer. Migdal discloses a combined system of stereolithography and machine vision, which can quickly and accurately scan an object, store data from said scan, and manipulate said object based upon programmed instructions (col.3 line 59 – col.4 line 17). It is implied that said system would be capable of including at least one parameter of another device component in computer memory. Therefore, it would have been obvious to a person skilled in the art at the time of the invention to use the stereolithography and machine vision combined system of Migdal with the method of forming a semiconductor device of Ghaem in view of Hull in order to consistently mass produce semiconductor devices with stabilizers quickly and accurately.

Response to Arguments

Applicant's arguments with respect to claims 1-23 and 36-40 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

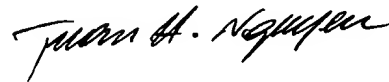
Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nema O Berezny whose telephone number is (703) 305-3445. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on (703) 306-2794. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722 for regular communications and (703) 308-7722 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

NB
February 28, 2002



Tuan H. Nguyen
Primary Examiner